

# **The Effects of Double Minority Status on Stereotype Threat and Heart Rate Variability**

A Senior Honors Thesis

Presented in partial fulfillment of the requirements for graduation with honors research distinction in psychology in the undergraduate colleges of The Ohio State University

by

Kinjal D. Pandya

The Ohio State University

May, 2013

Project Adviser: Dr. Julian F. Thayer, Department of Psychology

### Abstract

Research shows that minorities who suffer from chronic stressors such as discrimination, racism, and prejudice, may experience deleterious physiological effects. More importantly, these race specific stressors may contribute to health disparities between minorities and non-minorities in America. Furthermore, research has shown that when negative thoughts about one's own group are made salient in minority groups, performance on subsequent tasks can suffer. This phenomenon is known as stereotype threat (ST) and can be detrimental to mental and physical function. Recently, this work has been extended to examine the 'double minority effect', defined as "the psychological state created when two devalued identities interact to influence the individual in a way that is greater than the sum of the independent effects of those identities." This concept suggests that minority women may be susceptible to multiple sources of stereotype threat. Although many studies have examined ST in relation to performance on cognitive tasks, few have studied the possible physiological effects of ST in double minorities. The current study examines the possible relationship between ST and heart rate variability (HRV), a measure of emotional flexibility and overall cardiovascular health, in a sample of women. 58 undergraduate women (52% ethnic minority) were randomized in either a ST or control condition and underwent a baseline, task, and recovery period. HRV data was collected continuously throughout the study via an electrocardiogram (EKG). Lastly, participants answered both the perceived ethnic discrimination questionnaire (PEDQ) and the race (SCR) and gender (SCW) based stigma questionnaires; where these scales have been related to overall endorsement of ST. Firstly, we found that there was a difference in conditions between test performance such that individuals in the control condition outperformed participants in the ST condition ( $t(56) = .233$ ,  $p > .05$ ). Results revealed that White women scored higher on the SCR compared to minority women in general ( $t(55) = 5.041$ ,  $p < .001$ ). Additionally, minority women scored higher on the SCW than White women in the ST condition ( $t(25) = -2.654$ ,  $p = .010$ ) but not in the control condition ( $p > .05$ ). Interestingly, in the ST condition only, results indicated that HRV at recovery was negatively correlated with scores on the SCR for women in the ST condition ( $r = -.348$ ,  $p = .081$ ). Conversely, HRV at recovery was positively associated with scores on the SCW ( $r = .395$ ,  $p = .046$ ) in ST condition only. These data assists in better understanding the ways in which gender and racial identities can influence one's mental and physical responses to stigma, and how this can be influenced by ST in both gender and ethnic minorities.

### Acknowledgements

I would like to thank Dr. Thayer for giving me the opportunity to be a research assistant in the Emotions and Quantitative Psychophysiology Laboratory. Secondly, I would like to thank LaBarron Hill for helping me develop my research interests, build the experiment, and seek funding for my research. A special thanks to DeWayne Williams for advising me in making various modifications to the study, guiding me through data analyses, and encouraging me to submit my findings to national conferences. Additionally, I would like to thank my friend and fellow lab colleague Anjni Patel for being my intellectual and moral support throughout this entire process. Lastly, I would like to thank my family and friends for their continued patience and enthusiasm in my work.

## Introduction

Disparities exist in cardiovascular disease (CVD) such that women and certain minority groups are at a greater risk for prevalence and death from the disease. (Karlman, Merkin, Crimmins & Seeman, 2010). Various risk factors, such as high blood pressure, lack of physical activity, access to health care, and socioeconomic status (SES) put African Americans (AA) at greater risk for developing CVD than Caucasians (Ofili, 2001). Moreover, CVD is the leading cause of death in America. Specifically, heart disease affects the same number of men and women each year, however only 54% of women realize that it is the number one cause of death within their gender (Mosca, Mochari-Greenberger, Dolor, Newby & Robb 2010). Furthermore, 7.6% of AA women, 5.6% of Hispanic women, and 5.8% of White women have coronary heart disease (Roger, Go, Lloyd-Jones, Benjamin, Berry, Borden et al, 2012). Women also are typically older when they report their first myocardial infarction and have more comorbid conditions such as diabetes, systolic hypertension, and obesity at the time of diagnosis (McSweeney, Pettey, Souder, & Rhoads, 2011). Since both minorities and women are at a greater risk of developing CVD, intuitively, minority women may be at even a greater risk. Therefore, it is important to study possible risk factors for CVD specific to minority women.

Minority women face a unique set of chronic stressors such as discrimination, racism, and prejudice which are associated with a number of adverse physiological consequences (Merritt, Bennett, Williams, Edwards & Sollers, 2006). For example, one study found that African American women had greater diastolic blood pressure following a racial discriminatory experience in comparison to their European American counterparts (Gyll, Matthews & Bromberger 2001). Furthermore, gender differences exist in the experience of stress and discrimination such that the influence of perceived discrimination on depression is greater for

women than men (Flores, Tschann, Dimas, Bachen, Pasch & de Groat, 2008). In the same study, researchers found that women tend to report higher levels of chronic and acute stressful life events compared to men, which can lead to more detrimental physiological outcomes (Flores et al 2008).

The above studies have examined the deleterious effects of discrimination and racism on physical health but very few studies have examined the physical effects of more subtle forms of inequality, such as stereotyping, which occurs more frequently (Steele & Aronson 1995). Research suggests that being aware of the negative stereotypes associated with one's group increase cognitive load (Croizet, Després, Gauzins, Huguet, Leyens & Méot, 2005) and thus, diminish working memory capacity (Schmader & Johns 2003). Claude Steele and colleagues (1995) coined this term stereotype threat (ST). ST occurs when negative stereotypes about one's group are made salient (Steele & Aronson, 1995). These stereotypes can be made salient by either implicit or explicit prompts. An example of an implicit or indirect prime is framing a test as a measure of intelligence. Due to the subtlety of this manipulation, the group-based stereotype may become salient to participants automatically or subconsciously. An explicit prime points out that a certain group usually outperforms another group on said test. Due to the bluntness of this prime, the stereotype is made salient in a conscious manner (Nguyen & Ryan, 2008). For example, in a series of studies, Claude Steele and colleagues found that under an implicit ST condition, women and African Americans tended to perform worse on standardized tests, such as sections of the Graduate Record Exam (GRE), when told that the test is a measure of intellect. Conversely, without such prompting, African Americans and women performed nearly identically to their White and male counterparts. Overall, ST is a stressor that affects minorities and women primarily, and has detrimental effects on cognition (Steele & Aronson 1995).

Recently, this work has been extended to examine the ‘double minority effect’, defined as “the psychological state created when two devalued identities interact to influence the individual in a way that is greater than the sum of the independent effects of those identities” (Gonzales, Blanton & Williams 2002). This concept suggests that individuals, such as minority women, may be susceptible to multiple sources of ST. To test this, researchers had male and female participants complete a diagnostic test of intelligence. These researchers used a general manipulation (i.e. “this is a measure of intelligence”) to evoke multiple group identities. The ST manipulation was explicit in that, half the participants were told that the test would be a genuine measure of their “true” abilities; while the non-diagnostic group was told that the test was a measure to understand the psychological factors involved in problem-solving. Results revealed a greater ST effect for gender in the diagnostic group in that, Latina women whom were told that their ability was being evaluated, performed worse than that their White female counterparts.

Moreover, previous work identifies ST as a psychological stressor that can impact physiological functioning and overall health. Specifically, authors from a recent review proposed that ST might be involved in the development of health disparities such as cardiovascular disease (CVD) between minorities and Whites (Burgess et al., 2010). Though this review proposes a link between ST and health, relatively few studies have evaluated ST in relation to acute physiological function. Additionally, researchers who have examined ST on physical indicators of health have relied heavily on sympathetic measures (e.g. blood pressure). For example, in a study conducted by Blasovich et al, they found that African American students under a ST condition exhibited an increase in mean arterial blood pressure during an academic test and performed poorly on difficult test items (Blasovich, Spencer, Quinn & Steele 2001).

Due to the relatively few studies examining the possible influence of ST on the parasympathetic nervous system (PNS), I propose that it is important to examine this connection, as that would allow me to study when the brain no longer senses threat, and restores the autonomic nervous system (ANS) to a homeostatic state. Research shows that psychosocial stressors, such as ST, can strain the heart by reducing vagal tone (Thayer & Lane, 2007). Vagal tone refers to the influence of parasympathetic nervous system (PNS) on the heart, and is responsible for autonomic balance. However, autonomic imbalance is known to be a marker for all-cause mortality (Thayer et al, 2012). Autonomic imbalance is characterized by a hyperactive sympathetic nervous system (SNS) and a hypoactive PNS. Greater PNS activity at rest results in a slower heart rate and an increase in heart rate variability (HRV) (Thayer & Lane, 2000). HRV refers to the variability in milliseconds between consecutive heartbeats (Thayer & Lane 2007). Thayer and colleagues (2000) proposed the Neurovisceral Integration Model to explain the how psychological states can influence physical health and suggest that HRV is a measure of this mind body connection. They propose that a set of neural substrates known as the central autonomic network (CAN) communicate with the autonomic nervous system (ANS) and this communication is indexed via HRV (Thayer & Lane, 2000). These substrates include frontal brain regions that exert control over the ANS and are involved in executive functioning processes (e.g., emotion and cognitive regulation). Balance between both the SNS and PNS of the ANS is vital for a healthy, adaptive organism. The PNS (rest-or-digest) is responsible for relaxing the body after a stressor whereas the SNS (fight-or-flight) is excitatory and is activated in a threatening situation. An adaptive individual should be able to properly interpret which situations are threatening and which situations are harmless and activate the correct emotional response accordingly (Thayer, Yamamoto, Brosschot, 2010). Importantly, longitudinal studies

demonstrate that low levels of HRV serve as a risk factor for future cardiac events and increased mortality (Thayer, Åhs, Fredrickson, Sollers, & Wager, 2012). Resting levels of HRV are not only a marker of physiological health but also self-regulatory capacity. For instance, individuals with higher levels of HRV at rest show greater capacity for emotional, cognitive, and behavioral regulation as assessed by a number of experimental tasks (Thayer, Hansen, Saus-Rose, & Johnsen, 2009).

Due to the crucial role of HRV in autonomic balance and overall emotional adaptability, I pose that it is important to include HRV into ST studies to see the possible physiological effects of ST on cardiovascular functioning. In addition to being a marker for emotional flexibility, HRV is also a measure of physiological arousal following a stressor. For example, previous research has connected subtle threat cues to lower HRV after the presentation of the threatening stimuli. In a study conducted by Elliot et al, participants who viewed the color red (which served as a subtle threat cue) before taking an IQ test exhibited a decrease in HRV and this decrease in HRV was related to worse performance on the IQ test. These results indicate that HRV can serve as an index of emotional and physiological reactivity in a threatening situation (Elliot, Payen, Brisswalter, Cury & Thayer, 2011).

More recently, HRV has been linked to subtle ST cues (Williams et al, *in prep*). Specifically, this study found that minorities had lower HRV at recovery in the implicit ST manipulation when compared to non-minority participants. This difference in HRV at recovery was not found in the control and explicit ST conditions. These results suggest that ST conditions are related to a decrease in vagal tone in minorities and moreover, that HRV can be used as a proxy for the effects of ST. Despite the multitude of studies that have demonstrated the negative effects of ST on cognitive performance, to date, few studies have examined the possible link



between an ambiguous ST condition and HRV. Previous ST studies have used explicit and implicit prompts to prime the participants to think about negative stereotypes about their group (Nyguen & Ryan 2008). However, no studies to date have used an ambiguous prime to activate multiple identities (i.e. race and gender) with just one prime.

Therefore, the purpose of this study was to examine if double minorities (women of various ethnic/cultural backgrounds) experience ambiguous ST events more frequently than other individuals that are not faced with this phenomenon. Consequently, these individuals may have more harmful effects on their cardiovascular function and cognitive performance in comparison to other groups. I hypothesized that women in the ST condition would exhibit lower HRV at recovery and perform worse on the cognitive task compared to the women in the control condition. Furthermore, I expected double minorities in the ST condition to feel more stigmatized and discriminated against (for both their gender and race) compared to White women in the ST condition. I predicted White women in the ST condition would feel more stigmatized as a result of their gender only.

## **Method**

### *Participants*

Female undergraduates (n=58) were recruited from the Department of Psychology Research Experience Program (REP) as well as from across the university to partake in the study. The participants were either awarded 1 hour research credit or \$8.00 as compensation for completing the study. Only participants who were between the ages of 18 and 30 were eligible for the study and the average age of the sample was 19.22 with a standard deviation of 1.96. The sample was composed of 28 White women and 30 minority women (53% Asian, 33% AA, 7%

Hispanic, and 7% bi-racial, *Figure 1*). Additional requirements included no physical activity, or smoking four hours prior to the experiment (Thayer et al, 2003).

### *Research Design*

Each individual participated in each of the three phases of the experiment: baseline, task, and recovery. We utilized a 2x2 between groups design to examine the effects of experimental condition (stereotype threat prime vs. no prime) and ethnicity (White vs. non White) on our dependent variables. The dependent variables include accuracy on the Raven's Matrices, scores on the gender and race based stigma consciousness scales and the perceived ethnic discrimination questionnaire, and HRV at recovery. All questionnaires and scales were self-reported.

### *Procedure*

Participants were brought into the lab and informed consent was obtained. After collecting demographic information, participants were connected to an electrocardiogram (EKG) and HRV data was collected continuously throughout the entirety of the experiment. First, individuals underwent a five-minute baseline period where they were asked to sit quietly while resting levels of heart rate were recorded. Secondly, individuals were randomized into either a control or ST condition. Individuals in the ST condition received a prime, which read, "The following task can serve as a measure of intelligence." The purpose of this prompt was to prime participants to start thinking about stereotypes related to intelligence measures. Immediately after, participants were primed for gender and ethnicity. The specific prompt was: "In the EQP Laboratory, we are interested in exploring gender differences in various measures of intelligence. Please identify your gender below." Shortly after, a collage faces of women of various ethnic/cultural backgrounds appeared on the screen to prime participants further to think of

stereotypes related to gender, ethnicity, and measures of intelligence. Then, participants were asked to identify their ethnicity. Again, the same collage of women of various ethnic/minority backgrounds flashed on the screen for 5 seconds. Finally, participants were shown a stereotype threat prompt: “The following task is a collection of figures that have been shown to produce group differences in the past. The average performance of members of your group was different from members of another group” (Keller 2003). The purpose of this ambiguous prime was to let the participants classify themselves into their own group based on their gender, race, both, or neither. Following this prime, participants completed the Raven’s Matrices (RM). Then, participants underwent a five-minute recovery period where they were again instructed to sit still and relax. Finally, they answered the raced based stigma consciousness scale (SCR), stigma consciousness for women (SCW), and the perceived ethnic discrimination questionnaire (PEDQ). Conversely, participants in the control condition completed the baseline, task, and recovery period. They too answered the same questionnaires after the recovery period. Lastly, all participants were disconnected from the EKG and debriefed.

### *Cognitive Task*

Raven’s Advanced Progressive Matrices was used as the cognitive task. This task is composed of a series of vertical and horizontal matrices or figures featuring designs such as angled and intersecting lines. In each matrix, participants must correctly identify a missing section of the figure by matching design features of the larger matrix with corresponding features on one of 6 ‘puzzle piece’ answer choices. The complexity of features increases progressively from matrix to matrix ranging from very easy to moderately difficult. This task has demonstrated acceptable reliability with other measures of fluid cognitive ability including the full Wechsler Adult Intelligence Scale ( $r=.74$ ) (Bors, 1998). Performance was determined as the number of items

completed correctly out of the total number of items (Bors & Stokes, 1998). Participants took an average of five to seven minutes to complete the 12-item task.

### *Physiological Measures*

Continuous HRV data was collected via an electrocardiogram (EKG) machine and *BioLab 1.11* computer software. Inner-beat-intervals (IBIs) were extracted from the HR data using *HRV 2.51 Analysis* software. The IBI is the time between two R spikes. *Kubios HRV Analysis* software was used to remove IBI outliers as well as calculate absolute high frequency (HF) of the IBI series.

The Kubios software program provides time and frequency domain indices of HRV. For frequency domain indices, we used autoregressive estimates of high frequency power (HF-HRV; 0.15-.40 Hz, ms<sup>2</sup>). Higher values of HF-HRV indicate stronger parasympathetic influence on heart rate. In the current study, high frequency power served as the primary index of HRV.

Values of HF-HRV were transformed logarithmically (base10) to better approximate a normal distribution. The lnHF was the final measure of HRV in the study (Task Force, 1996).

### *Stigma Consciousness Scale*

Stigma consciousness (SC) is a general sense of awareness about the stigmatized stature of one's gender or ethnic group. The stigma consciousness scale is a ten-item scale measuring the extent to which individuals expect to be stereotyped by others (Pinel, 1999). Previous research has shown that individuals high in SC tend to endorse more frequent ST (Brown, 2003). Elizabeth Pinel also developed the stigma consciousness for women scale (SCW) (Pinel, 1999). For both the race (SCR) and gender based scales (SCW), participants selected an answer ranging from 0 (strongly disagree) to 6 (strongly agree) for each item. The questionnaire was scored using a mix of reverse scoring and standard scoring (Pinel 1999).

### *Perceived Ethnic Discrimination Questionnaire*

Perceived discrimination (PD) is the perception of threatening, invalidating information or behavior due to one's ethnic background. Individuals, who score high in PD, are more likely to endorse ST (Brown 2003). The Perceived Ethnic Discrimination Questionnaire (PEDQ) was used as a self-report tool to measure PD. This measure consists of a total of 22 items that gauges seven forms of discrimination: verbal rejection, avoidance, exclusion, denial of equal treatment, disvaluing action, threat of aggression, and aggression. Participants use a seven point scale ranging from 1 (never) to 7 (very often) to rate how often over the past three months they have experienced each form of discrimination ( Contrada et al 2001).

### *Manipulation Check*

To examine the effectiveness of the ST prime, questions probing the participants' thoughts regarding the ST prompt were asked at the end of the experiment. The question was: "When your group was referenced, to what extend did you think of your gender/ethnicity?" Participants selected their answer from a scale ranging from 0=not sure and 4=definitely.

## **Results**

Firstly, there were no individual differences in resting levels of HRV. In line with the 2x2 between groups design, an analysis of variance (ANOVA) was conducted to test for main affects and interactions between condition and ethnicities on HRV at recovery (log natural of the high frequency), accuracy on the RM, and scores on the PEDQ, SCR, and SCW. There was no significant main effect for condition [ $F(1, 58) = 1.408, p = .241$ ] on accuracy on the Raven's Matrices. However, individuals in the control condition did outperform individuals in the ST condition (*Table 1*). There was not a significant main effect for condition on HRV at recovery [ $F(1, 55) = .018, p = .893$ ], PEDQ [ $F(1, 57) = .352, p = .555$ ], SCR [ $F(1, 57) = .163, p = .688$ ], and

SCW [ $F(1, 57) = .406, p = .527$ ] [Table 1]. Furthermore, there was no interaction between condition and ethnicity for either of these dependent variables.

There was a significant main effect for ethnicity [ $F(1, 57) = 20.864, p < .0001$ ] on PEDQ, SCR [ $F(1, 57) = 16.673, p < .0001$ ], and SCW [ $F(1, 57) = 6.301, p < .0001$ ] [Table 2]. Overall, minority women scored higher on the PEDQ compared to White women [Figure 2].

Furthermore, White women scored higher on the SCR compared to minority women [Figure 3].

Additionally, minority women scored higher on the SCW than women just in the ST condition but not in the control condition, [Figure 4].

To further investigate these results, correlational analyses examining SCR and SCW and their relationship to HRV were performed. Results indicated that HRV at recovery was marginally negatively correlated with scores on the SCR for women in the ST condition such that the higher scores on the SCR, the lower the HRV during recovery ( $r = -.348, p = .081$ ) [Figure 5]. Interestingly, HRV at recovery was positively associated with scores on the SCW such that the higher the SCW scores, the higher the HRV during recovery ( $r = .395, p < .05$ ) [Figure 5]. Furthermore, these findings are specific to the ST manipulation, as they were not found in the control condition. Lastly, results from the manipulation check revealed that 63% of women in the ST condition thought the prime was definitely referring to their ethnicity compared to 32% of women who thought it was definitely referring to their gender [Figure 6 & 7].

## Discussion

In this study, I investigated the possible psychological and physiological consequences of an ambiguous ST prime that made both gender and race identities salient in a sample of women. Previous research has shown that making ethnicity salient leads Latina women to think about the negative stereotypes about their gender but making gender salient does not lead to negative

thoughts regarding their ethnicity (Gonzales et al 2002). I wanted to further explore how multiple identities interact in stereotype threat conditions. I predicted that the sum total of more than one's stigmatized identity (i.e. race and gender) would lead to greater decrements in performance on the RM and higher scores on SCR, SCW, and PEDQ in my minority women in the ST condition compared to the White women in the same condition.

Results revealed that there were no significant differences in HRV at recovery or accuracy on the RM between conditions but we did observe that differences in scores on SCW, SCR, and PEDQ as a function of ethnicity. Minorities scored higher in PEDQ across all conditions, which is consistent with previous research that states minorities feel more discriminated against than non-minorities (Contrada 2001). However, differences between scores on the RM were trending in the right direction. Individuals in the control condition did perform better than individuals in the ST condition. This replicates previous research in that individuals in a ST condition usually underperform compared to individuals in a control condition because being in a threatening situation can put cognitive mental load and reduce the working memory needed to complete the task at hand (Schmader & Johns, 2003). Lastly, HRV at recovery did not differ significantly by condition. Interestingly, minority women had higher HRV at recovery in ST condition compared to White participants ( $t(26) = .229, p > .05$ ). Although the result is not significant, it is noteworthy because minority women also scored higher on the SCW in just the ST condition. Furthermore, scores on the SCW and HRV at recovery were positively correlated for just the women in the ST condition. In sum, for minority women, identifying with their gender instead of their race seemed to be a protective mechanism for cardiovascular functioning.

On the contrary, White women felt more stigmatized because of their race as evidenced by their high scores on SCR. Furthermore, SCR was negatively correlated with HRV at recovery

in the ST group only. These results are surprising as previous results suggests that being a member of the racial majority (i.e. White American) would serve as a protective factor physically and mentally. Therefore, I predicted White women would feel more stigmatized for being female especially due to the negative stereotypes associated with females underperforming males in measures of intelligence. Results indicated the opposite: White women had the highest scores on SCR, thus, having a lower HRV at recovery. There are a few theories as to why this may be. Recent studies have shown that White Americans feel a certain level of stigma because of the negative stereotypes associated with White people being prejudiced, racist, and “ignorant” (Hughey 2012). For this reason, it is possible that the White women in my sample felt stigmatized due to the negative generalizations associated with being a White American.

Furthermore, some research suggests that the race/ethnicity of the experimenter can affect the results of a study (Marx & Goff, 2005). For example, in a ST study, when Black experimenters were giving instructions to Black participants, these participants did not underperform their White counterparts on the task and felt less threatened (Marx & Goff, 2005). Similarly, in my experiment, I exclusively ran the experiments. My Indian ethnicity may have influenced the way participants thought about their own ethnicity or gender. Interacting with me could have activated various stereotypes about Indian people, or various stereotypes about the participants’ own ethnic group. This might have influenced the way participants responded psychologically (SCR & SCW) and physically (recovery HRV). Another possible reason that White Americans may feel more stigmatized can be because of the changing minority majority demographic. For example, researchers say that by 2050 the minorities will be the majority (Taylor & Cohn 2012). This shifting dynamic may make some White Americans to feel “reverse discrimination” or at least make them more aware of their race and the negative stereotypes



associated with that (Pincus 2001). Further research should be conducted to explore this phenomenon.

In addition to the questionnaire and HRV data, the ST manipulation responses shed more light on the interaction between gender and ethnic identities. Overall, the majority of both White and minority women in the ST condition thought the prime was referring to their ethnicity (*Figure 7*). The fact that the many of the minority women reported thinking that the prime was about their ethnicity (*Figure 9*) but proceed to score high on stigma consciousness for women is contradictory at first glance. However, research suggests that individuals have a hard time reporting what they are actually feeling versus what they think they are feeling (Podsakoff & Organ, 1986). Furthermore, unconscious stress may not be reportable consciously (Brosschot 2010). Brosschot and colleagues (2010) suggest that physiological measures can account for unconscious stress or thoughts one is unable to report consciously. For example, the current investigation shows that after the recovery period, minority women in the ST condition reported thinking that the prime was referring to their race. However, during the questionnaire phase following this manipulation check, they had higher scores on the stigma consciousness for women scale as compared to white women across all conditions. Furthermore, these scores were positively correlated with HRV at recovery; thus, I conclude that thinking about one's gender over one's ethnicity is related to better cardiovascular outcomes. A possible explanation is that, in the ST condition, stereotypes were made salient in the unconscious mind, allowing women to think about the times they felt stigmatized. The SCW and SCR scale assess stigma in each domain and since the ST manipulation should have made these thoughts salient, they should score highest on the identity they feel most stereotyped. For example, the SCW is not directly asking participants whether they are feeling this way as a result of the ST manipulation, but

rather if they feel stereotyped on the basis of their gender on a day to day basis. This suggests that as a result of the ST manipulation, these day-to-day interactions may become more salient, thus, individuals scoring higher on either scale. As evident by the overall results, I pose that the ST manipulation check can be thought of as an explicit measure while the stigma scales can be thought of as an implicit measure of the ST manipulation. However, scores for White women on the stigma scales and manipulation check were consistent. The majority of White women reported that they thought the prime was referring to their ethnicity (*Figure 11*); they also had higher scores on the SCR compared to non-White participants, and consequently exhibited lower HRV at recovery. The assortment of responding of the minority women can be attributed to the fact that in a conscious manner, they thought about race however in an unconscious manner, they were in fact thinking about their gender.

Overall, the results from this study suggest that perhaps negative stereotypes regarding sex differences in intelligence may not be as harmful to women in comparison to past studies. Despite the large gap between men versus women in the math and sciences fields, in current times, the number of women in these respective fields has increased (Cheryan 2011). Furthermore, the environment may have played a role in the results. My sample consists of undergraduate females from a large, public, liberal, school (Ohio State) from a wide variety of majors and disciplines. Furthermore, the gender demographic at Ohio State is split 50% female and 50% male (Ohio State Statistical Summary) illustrating that numerically, females are not in the minority. In sum, gender stereotypes may still exist but perhaps women themselves identify less with these stereotypes do to changing demographics. In closing, results of my study point to the damaging effects of race based stigma on both cardiovascular health and psychological well-being.

### **Limitations and Future Directions**

In the current study, a possible confounding variable is the picture used to prime the women in the ST condition. It was a collage of women of different races and it flashed on the screen after participants were primed for their gender and then again after being primed for ethnicity. The purpose of the prime was to make both gender and race salient in the minds of the participants.

However, instead the unequal distribution of White vs. non-White women in the collage and the absence of men in the collage might have influenced how individuals identified themselves. For example, even though the collage contained pictures of an Asian woman, Indian woman, White woman, Hispanic woman, and Black woman, White women who saw this picture might group all the non-White women in one category (minority) in their head and therefore see the lone White woman as the minority numerically. This may lead to feelings of stigma because of being White rather than being a female. For the minority women, the picture may mean that there are many women (most of whom are minorities) so they may think more about their gender rather than race. This can explain their high scores on SCW in just the ST condition. These are some possible reasons as to why the collage could have been a possible confounding variable that affected the way women scored on SCR and SCW.

Future studies that examine stereotype threat in double minorities should also include men as a comparison group for females to gain a greater understanding of the role gender stereotypes play as well as the interplay between race and gender stereotypes in general. Furthermore, different minorities have different stereotypes associated with them. Therefore, to study the effect of negative stereotypes on task performance, stigma, and HRV, minorities that have similar stereotypes associated with their cultural/ethnic group should be included. For

example, Black Americans and Hispanic Americans have different stereotypes associated with their intelligence than Asian Americans who are considered the “model” minority (Schmader, Johns & Forbes 2008). In my sample, I had a mix of people from various cultural groups who may or may not identify with the same stereotypes. This mixed sample can serve as a confounding variable because of the multiple interpretations numerous individuals can have to a ST situation.

### **Conclusion**

In sum, the purpose of this study was to examine the effects of an ambiguous ST event on a sample of women. Results revealed differences in scores of race and gender based stigma between ethnicities such that White women felt more stigmatized due to their race and minority women felt more stigmatized due to their gender in the ST condition. Better cardiovascular functioning was associated with higher scores on the SCW, and the opposite for scores on the SCR. Lastly, results suggest that minority women who focus on their gender instead of race may serve as a protection factor for autonomic imbalance. These results can help us better understand the ways in which gender and racial identities can influence one’s feelings of stigma and cardiovascular functioning following a stressor that is specific to gender and ethnic minorities.

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Appendix

Figures

Ethnicity breakdown

Figure 1

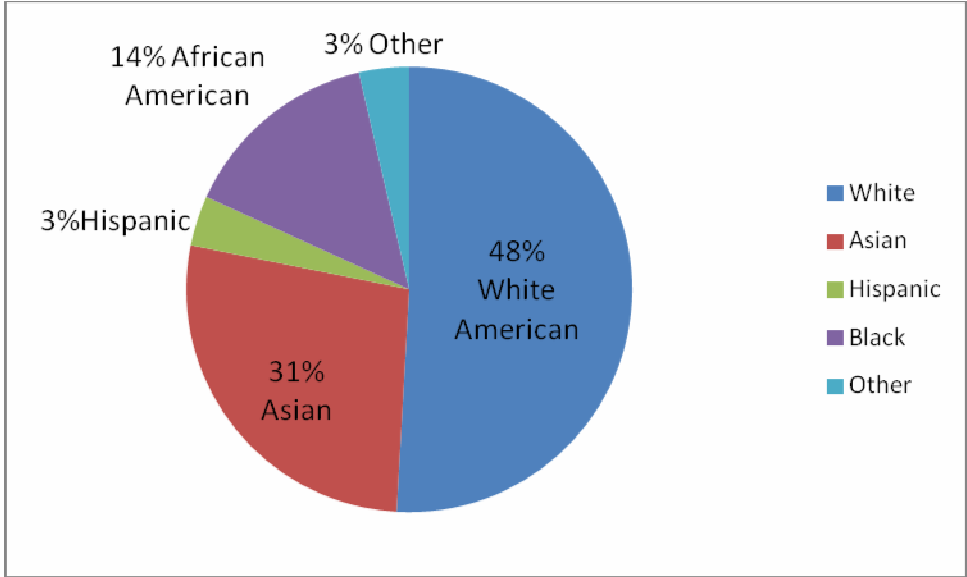


Figure 2

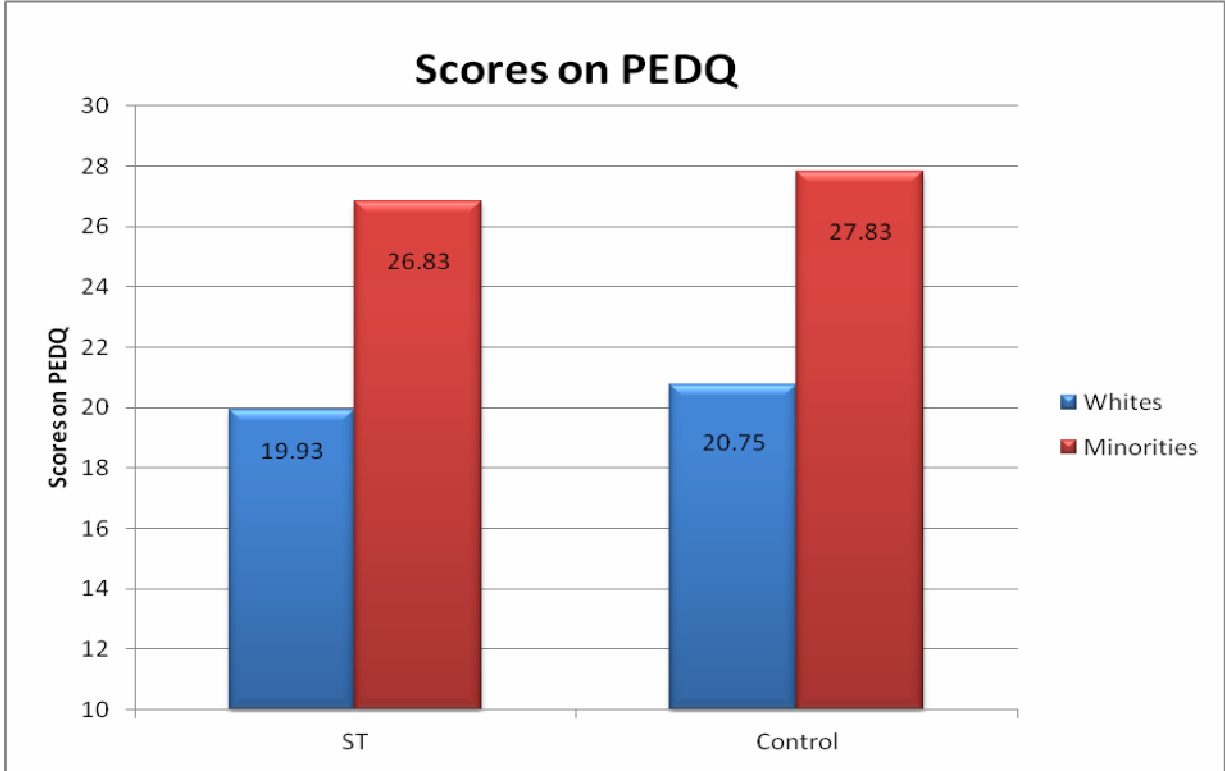


Figure 3

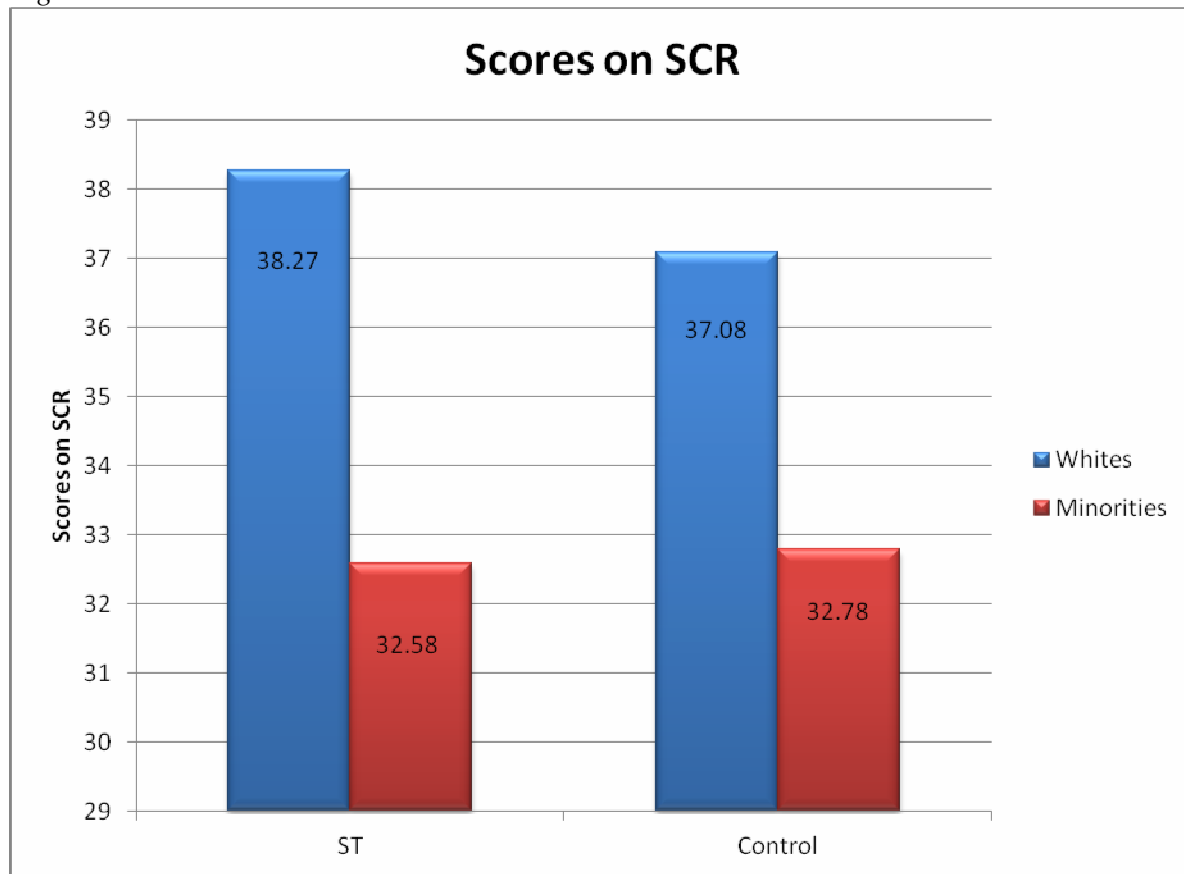


Figure 4

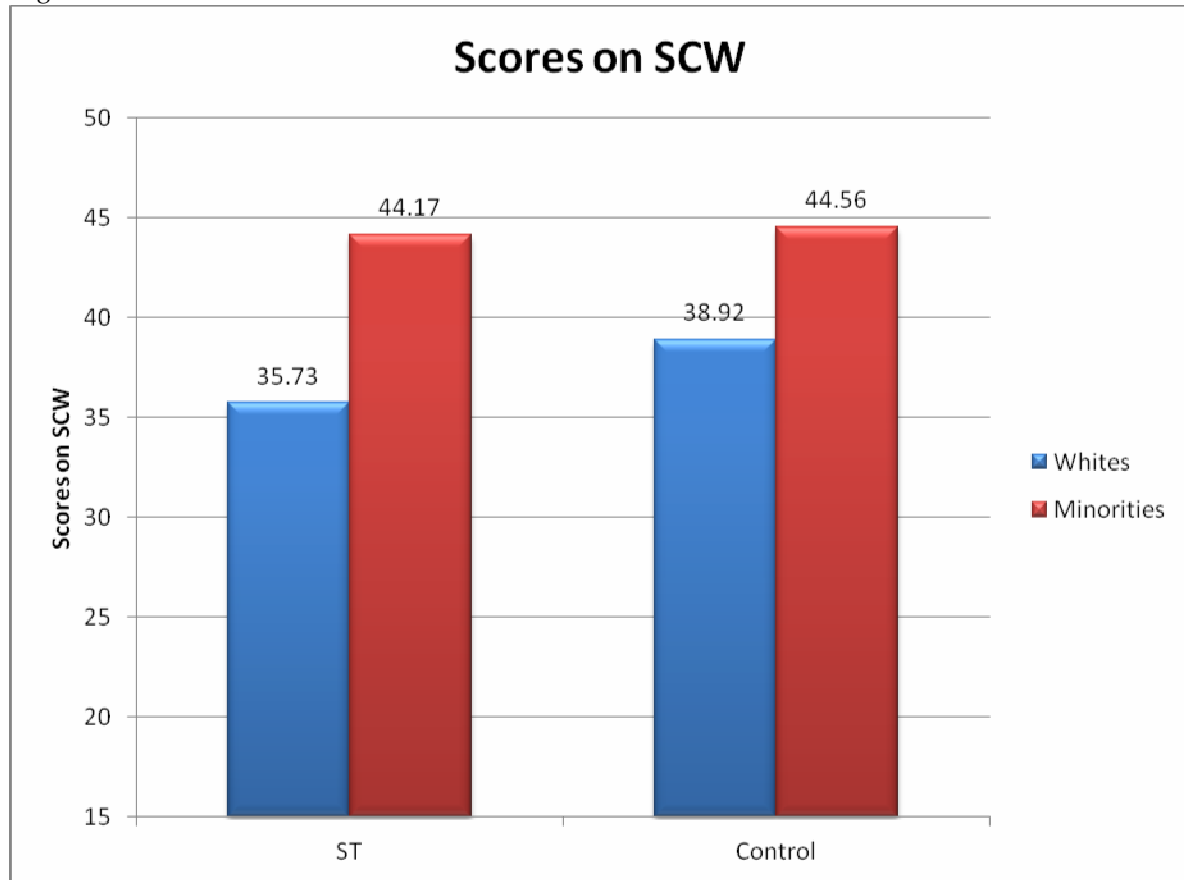


Figure 5

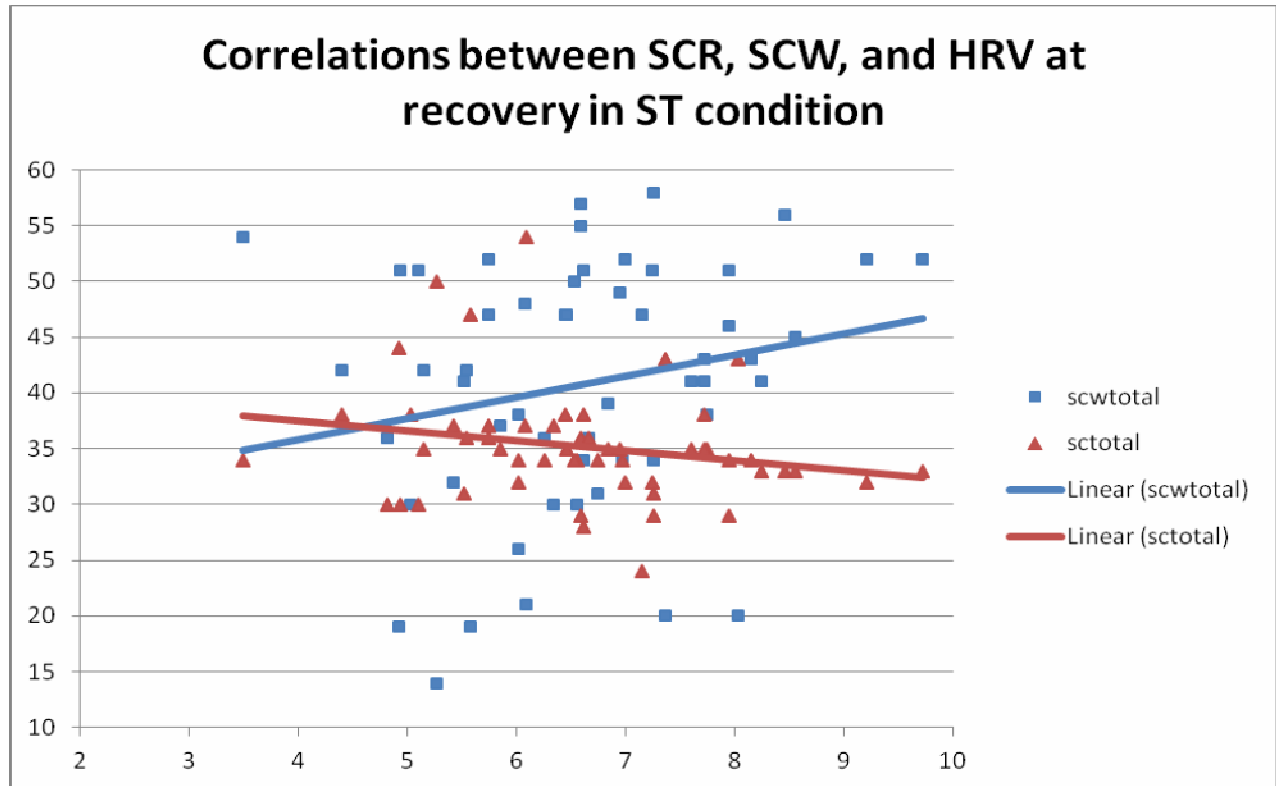


Table 1 Main affects on dependent variables between conditions

Dependent variable	Control(Mean, SD)	ST (Mean, SD)	F-statistic	df	sig
ln(HF)recovery	6.56,1.33	6.66,1.18	.066	(1,53)	.798
Accuracy on Raven's Matrices	.51,.17	.45,.19	1.453	(1,56)	.233
PEDQ	25,7.15	23,5.94	1.304	(1,55)	.258
SCR	34.50,4.69	35.74,5.58	.832	(1,55)	.366
SCW	42.30,10.69	39.48,11.09	.960	(1,55)	.332

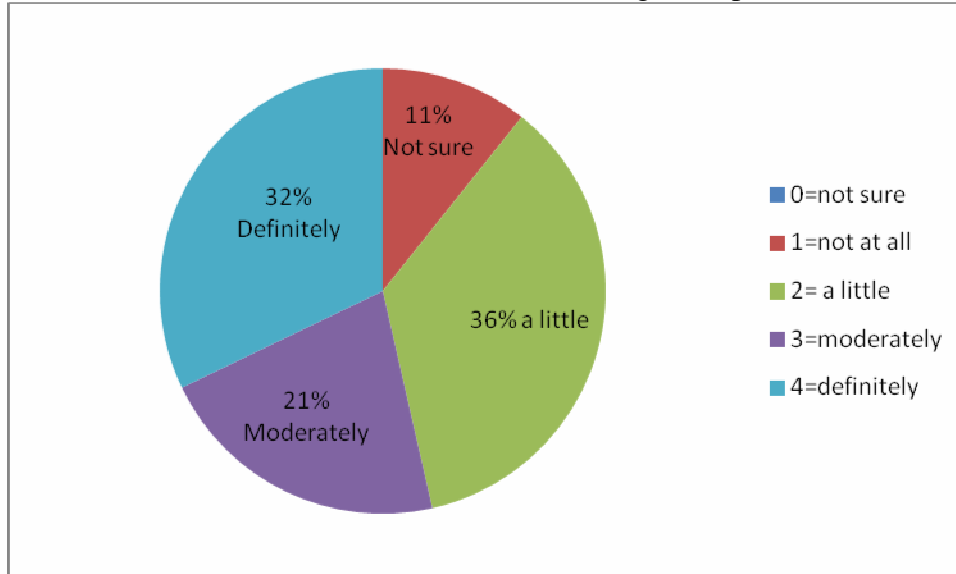
Table 2 Scores on SCW, SCR, and PEDQ between ethnicities across both conditions

	Whites (Mean, SD)	Minorities (Mean, SD)	F-statistic	df	sig
SCW	37.15, 11.37	44.10, 9.23	6.301	(1,57)	.0001
SCR	37.34, 5.57	32.70, 3.22	16.673	(1,57)	.0001
PEDQ	20.30, 3.57	27.43, 6.97	20.864	(1,57)	.0001

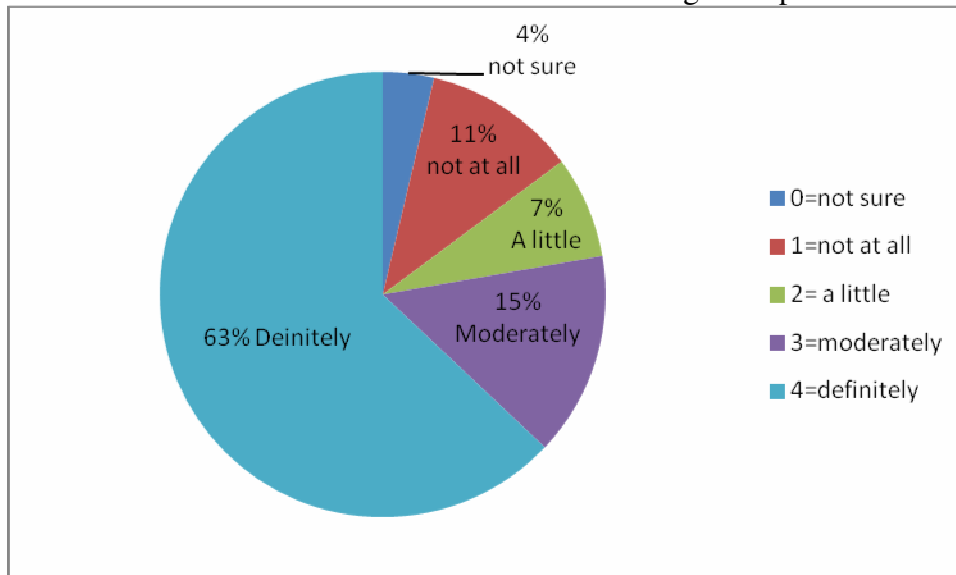
## Manipulation Check

*Figure 6*

The extent to which women in ST condition thought the prime was referring to their gender

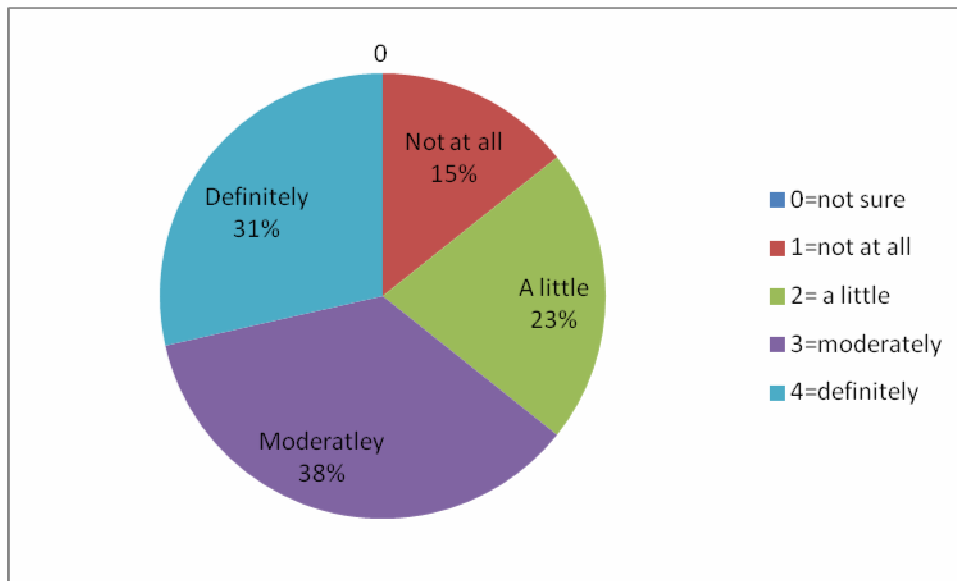
*Figure 7*

The extent to which women in the ST condition thought the prime was referring to their ethnicity



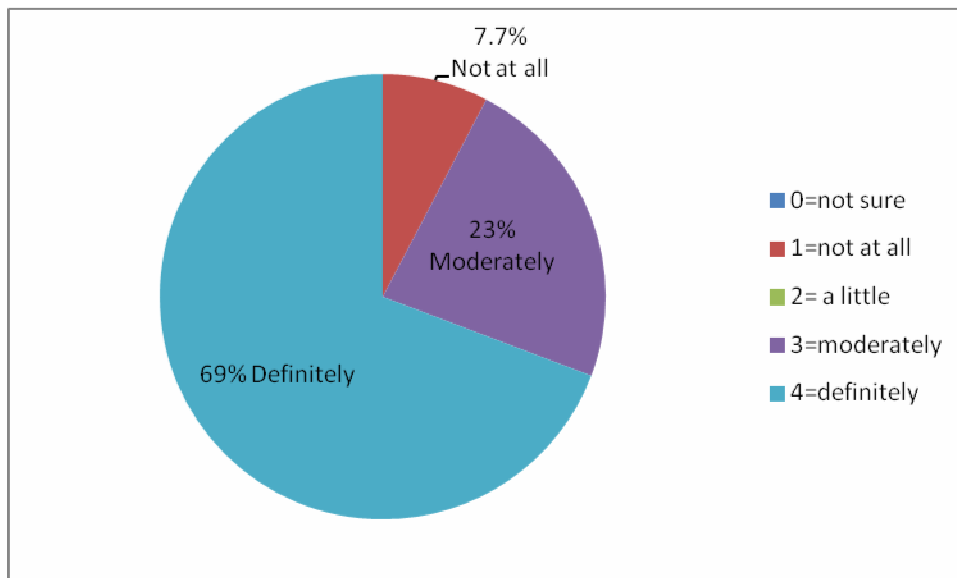
*Figure 8*

The extent to which minority women reported thinking that the prime was referring to their gender



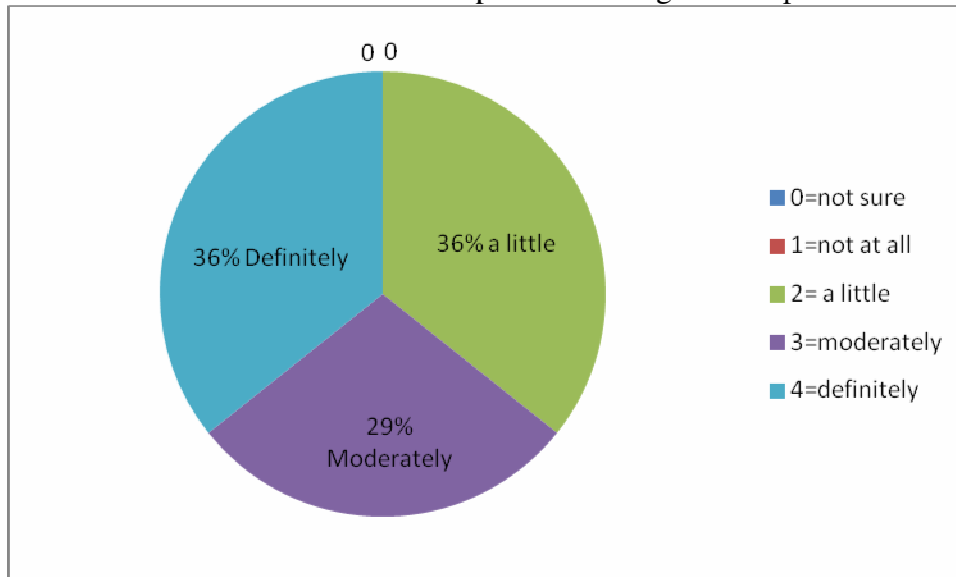
*Figure 9*

The extent to which minority women reported thinking that the prime was referring to their ethnicity

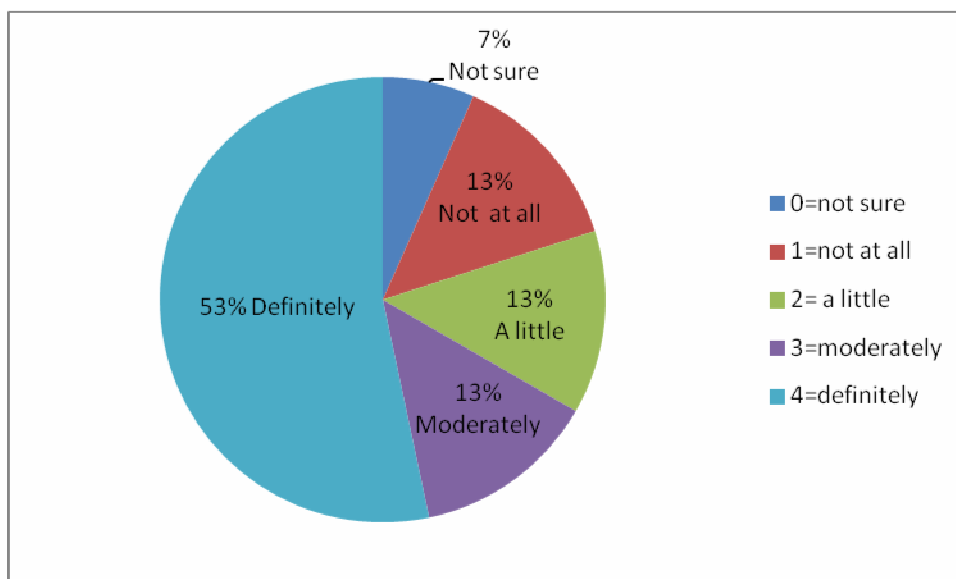


*Figure 10*

The extent to which white women reported thinking that the prime was referring to their gender

*Figure 11*

The extent to which white women reported thinking that the prime was referring to their ethnicity



## Self Report Measures

### Stigma Consciousness for Women

Instructions: We are all members of different social groups or categories. We would like you to consider your gender in responding to the following statements. If you haven't experienced the situation described in a particular statement, please answer how you think you would feel if that situation occurred.

Scale: 0 (strongly disagree) to 6 (strongly agree)

1. Stereotypes about women have not affected me personally. (R)
2. I never worry that my behaviors will be viewed as stereotypically female. (R)
3. When interacting with men, I feel like they interpret all my behaviors in terms of the fact that I am a woman.
4. Most men do not judge women on the basis of their gender. (R)
5. My being female does not influence how men act with me. (R)
6. I almost never think about the fact that I am female when I interact with men. (R)
7. My being female does not influence how people act with me. (R)
8. Most men have a lot more sexist thoughts than they actually express.
9. I often think that men are unfairly accused of being sexist. (R)
10. Most men have a problem viewing women as equals.



**Stigma Consciousness Race**

Instructions: We are all members of different social groups or categories. We would like you to consider your race in responding to the following statements. If you haven't experienced the situation described in a particular statement, please answer how you think you would feel if that situation occurred.

Scale: 0 (strongly disagree) to 6 (strongly agree)

1. Stereotypes about my race have not affected me personally.
2. I never worry that my behaviors will be viewed as stereotypical of my race.
3. When interacting with people, I feel like they interpret all my behaviors in terms of the fact that I am a member of my racial group.
4. Most people do not judge others on the basis of their race.
5. My belonging to my racial group does not influence how other members of my racial group act with me.
6. I almost never think about the fact that I am a member of my racial group when I interact with people.
7. My belonging to my racial group does not influence how people act with me.
8. Most people have a lot more racist thoughts than they actually express.
9. I often think that people are unfairly accused of being racist.
10. Most people have a problem viewing individuals belonging to my racial group as equals.

**Perceived Ethnic Discrimination Questionnaire**

Instructions: How often have any of the things listed below happened to you, because of your ethnicity?

Scale: 1 (never) to 7 (very often)

1. Have you been treated unfairly by teachers, principals, or other staff at school?
2. Have others thought you couldn't do things or handle a job?
3. Have others threatened to hurt you (ex: said they would hit you)?
4. Have others actually hurt you or tried to hurt you (ex: kicked or hit you)?
5. Have policemen or security officers been unfair to you?
6. Have others threatened to damage your property?
7. Have others actually damaged your property?
8. Have others made you feel like an outsider who doesn't fit in because of your dress, speech, or other characteristics related to your ethnicity?
9. Have you been treated unfairly by your co-workers or classmates?
10. Have others hinted that you are dishonest or can't be trusted?
11. Have people been nice to you to your face, but said bad things about you behind your back?
12. Have people who speak a different language made you feel like an outsider?
13. Have others ignored you or not paid attention to you?
14. Has your boss or supervisor been unfair to you?
15. Have others hinted that you must not be clean?
16. Have people not trusted you?
17. Has it been hinted that you must be lazy?